FIG. 1

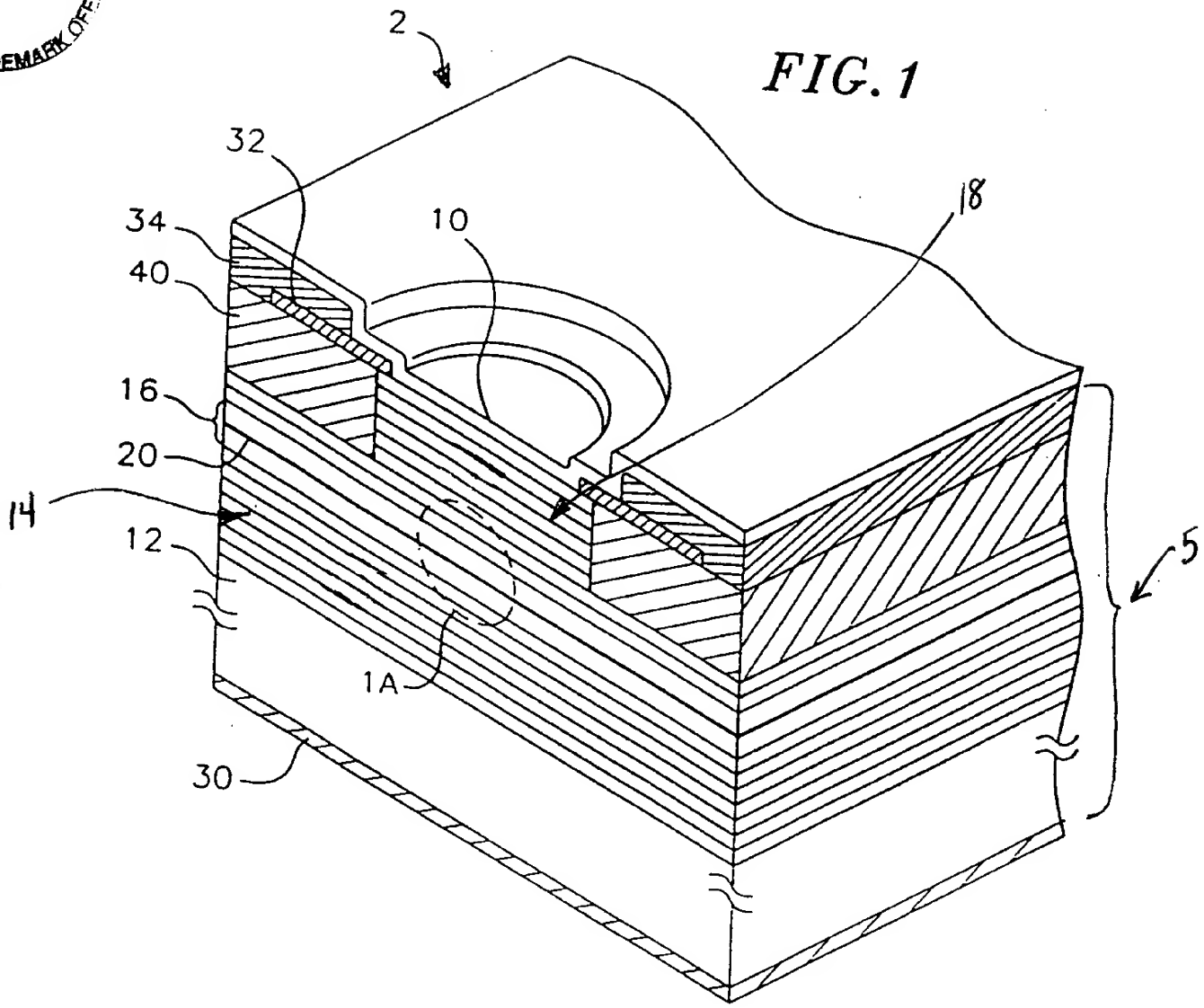


FIG. 1A
PRIOR ART

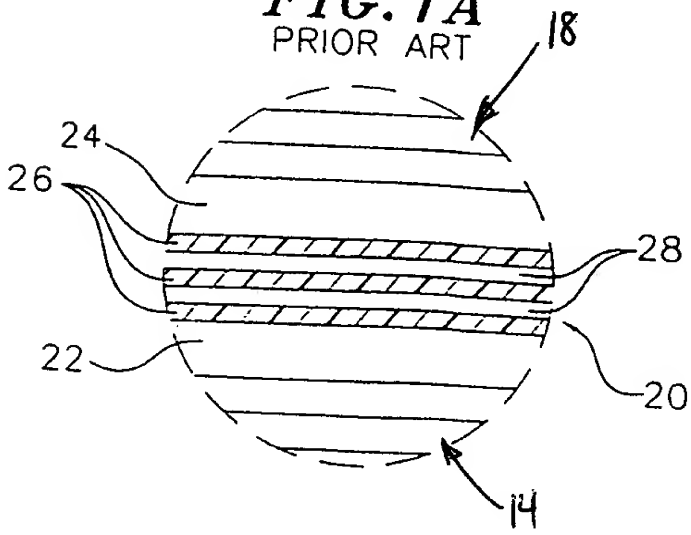
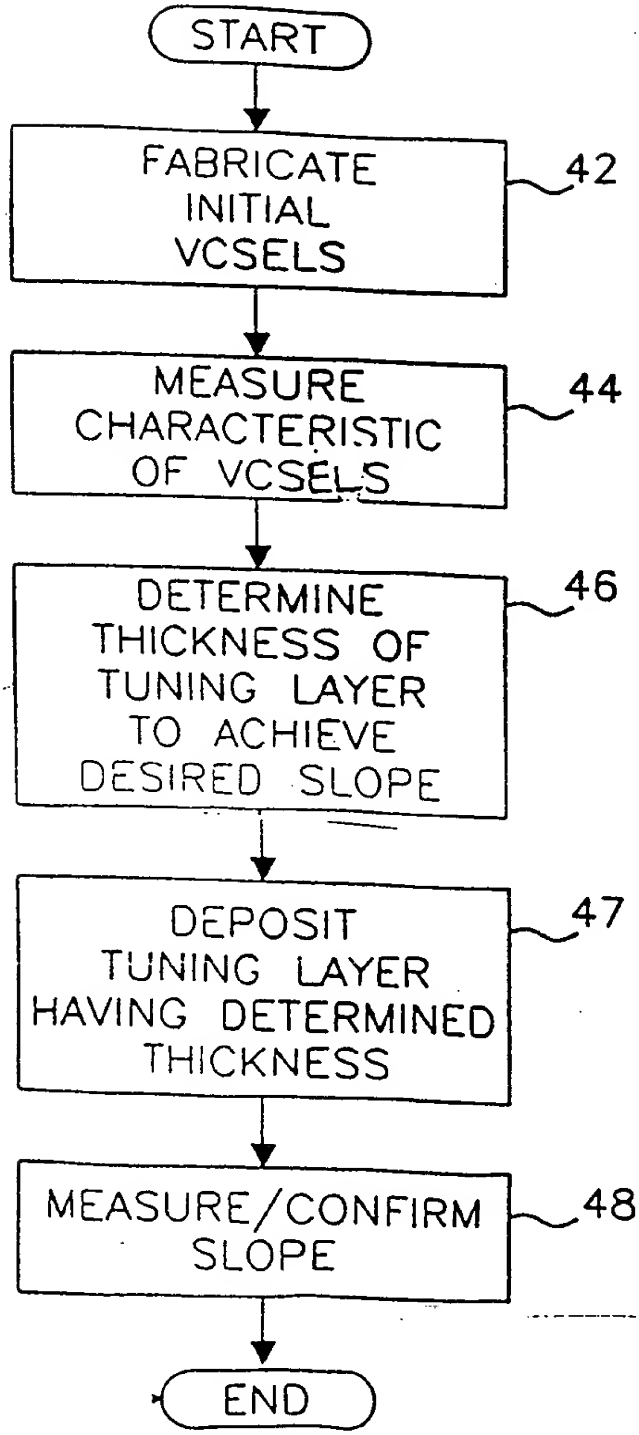


FIG. 2



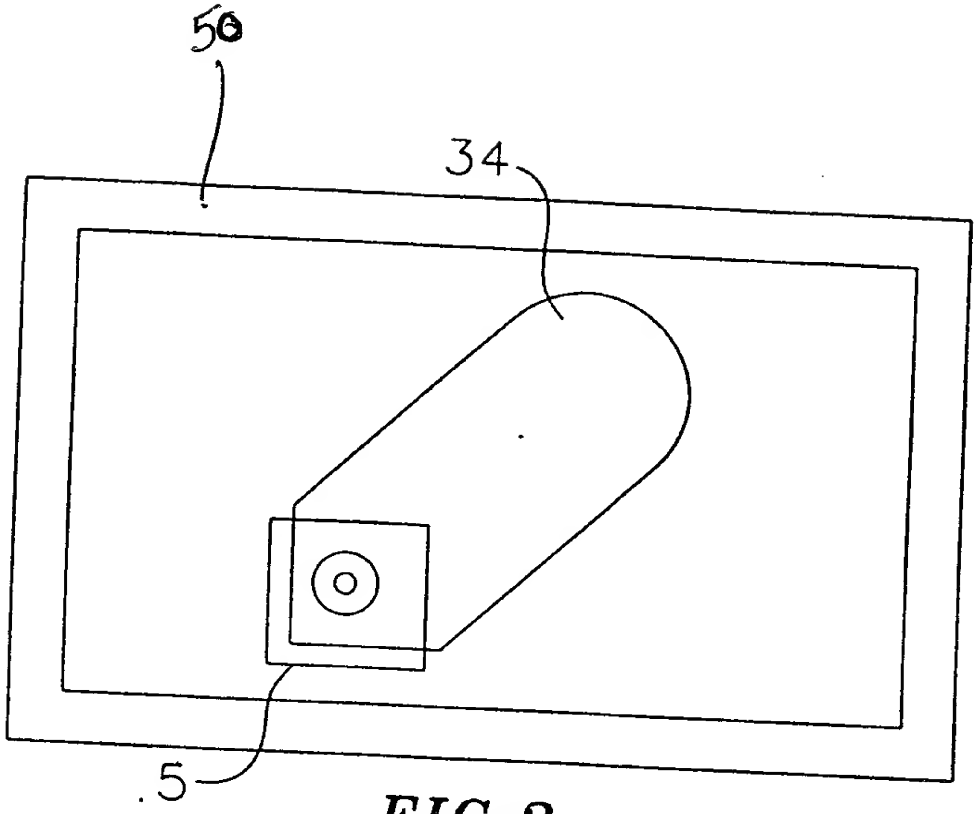


FIG. 3

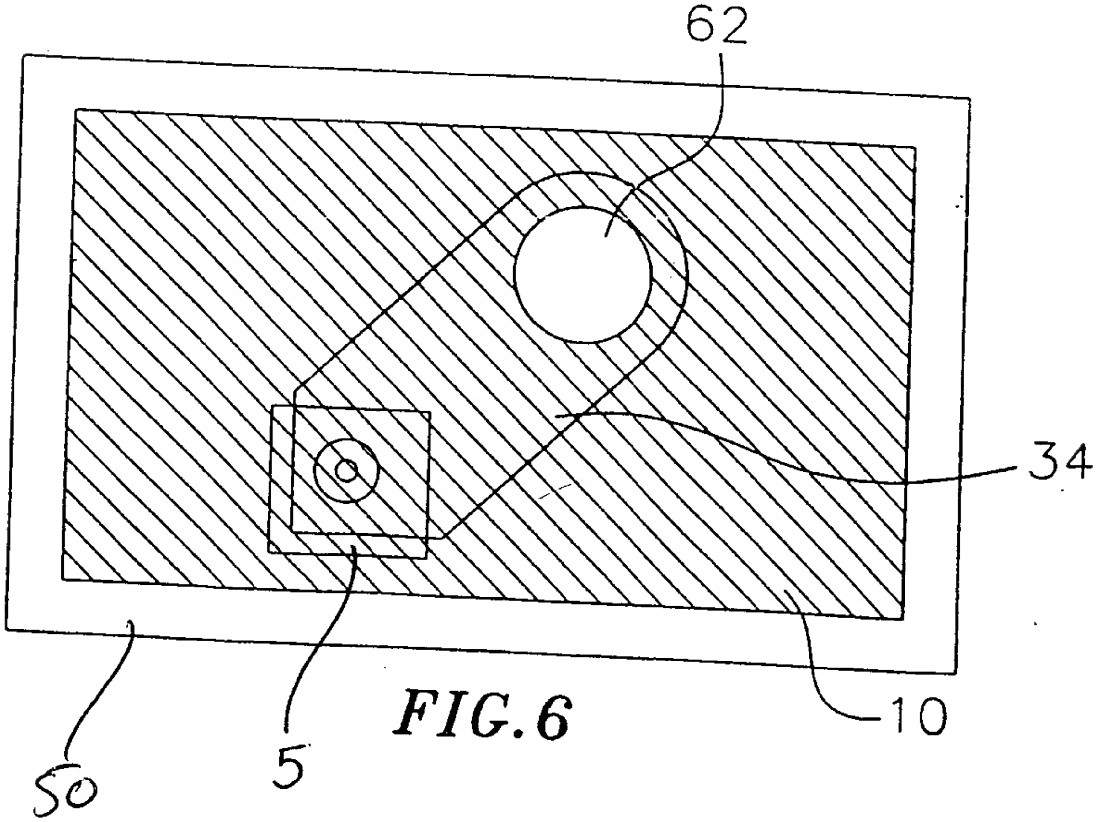


FIG. 6

FIG. 5

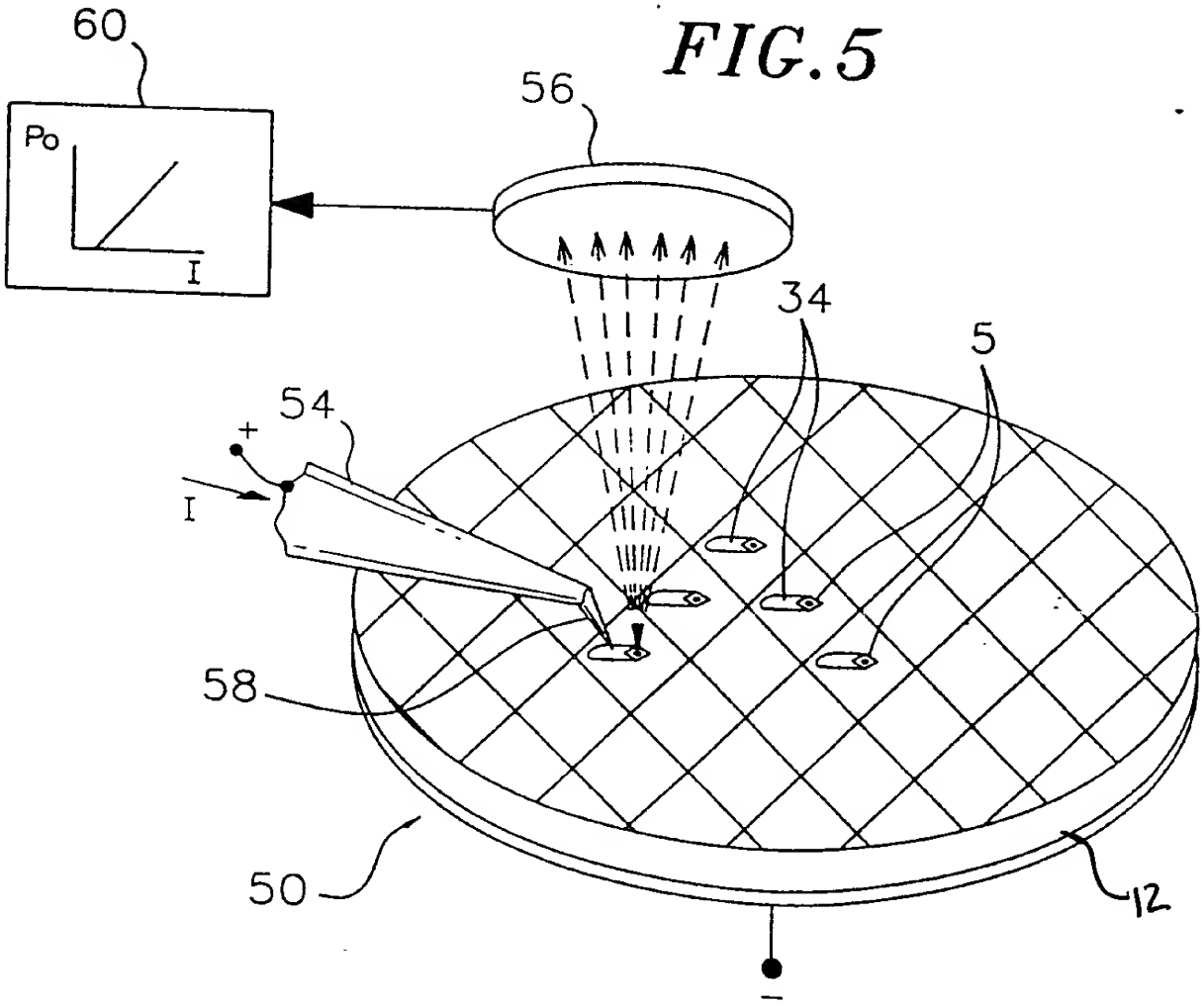


FIG. 4

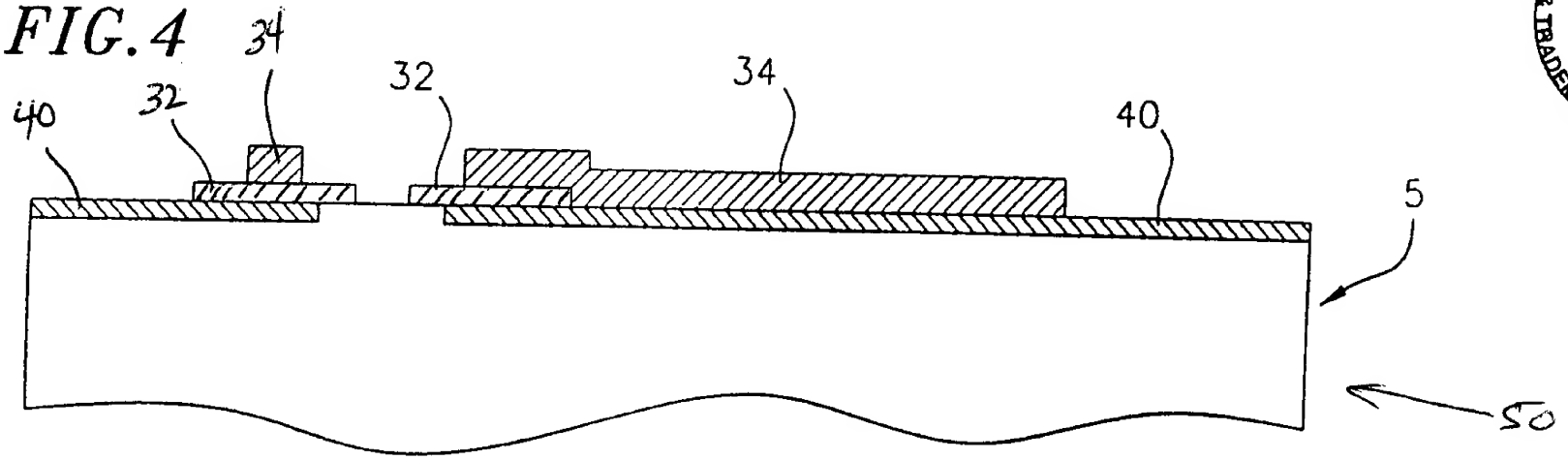


FIG. 7

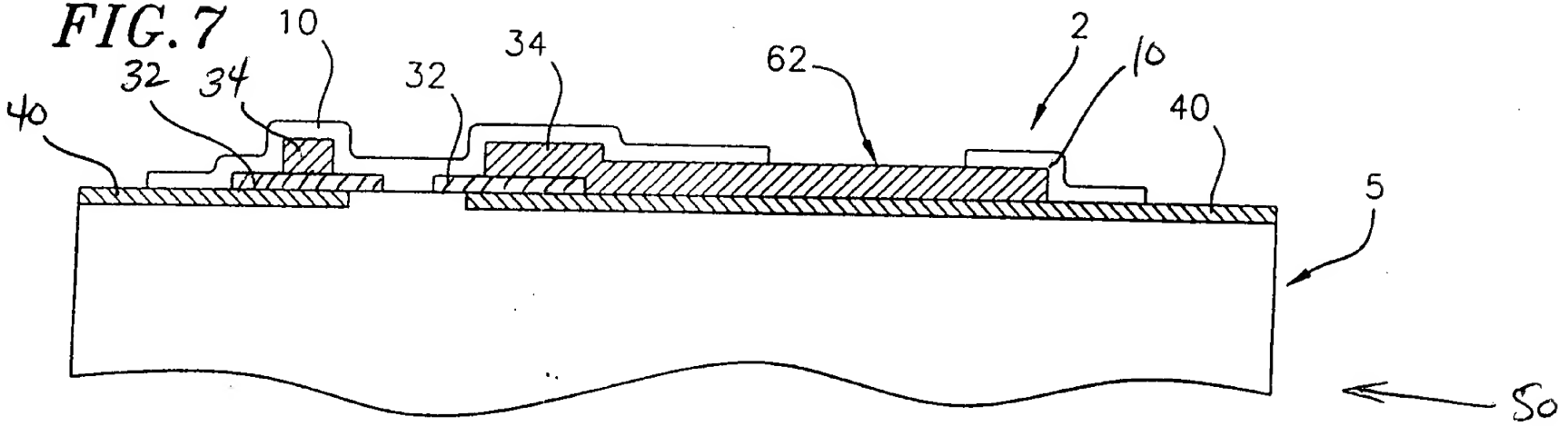


FIG. 8

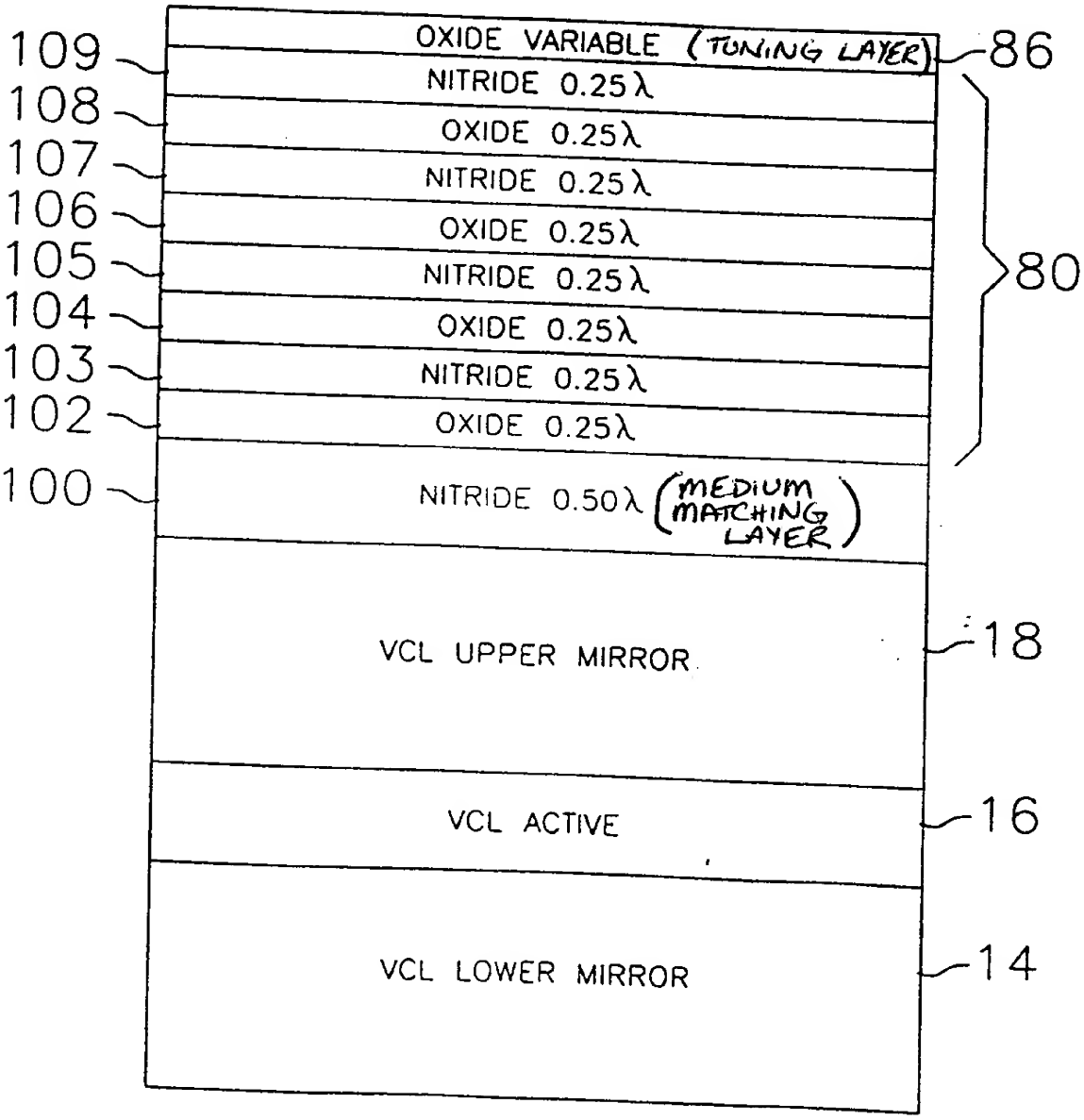
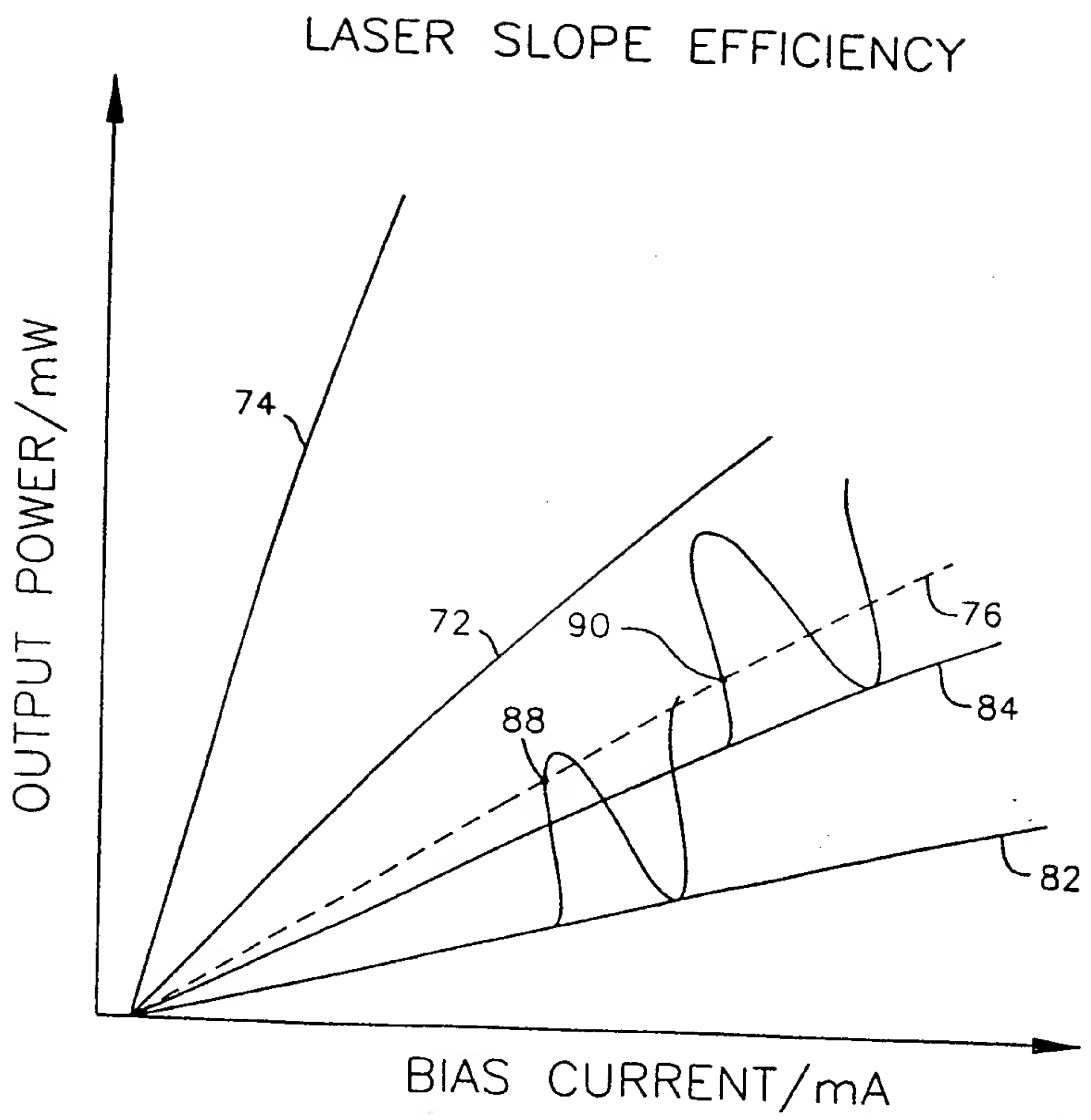


FIG. 9



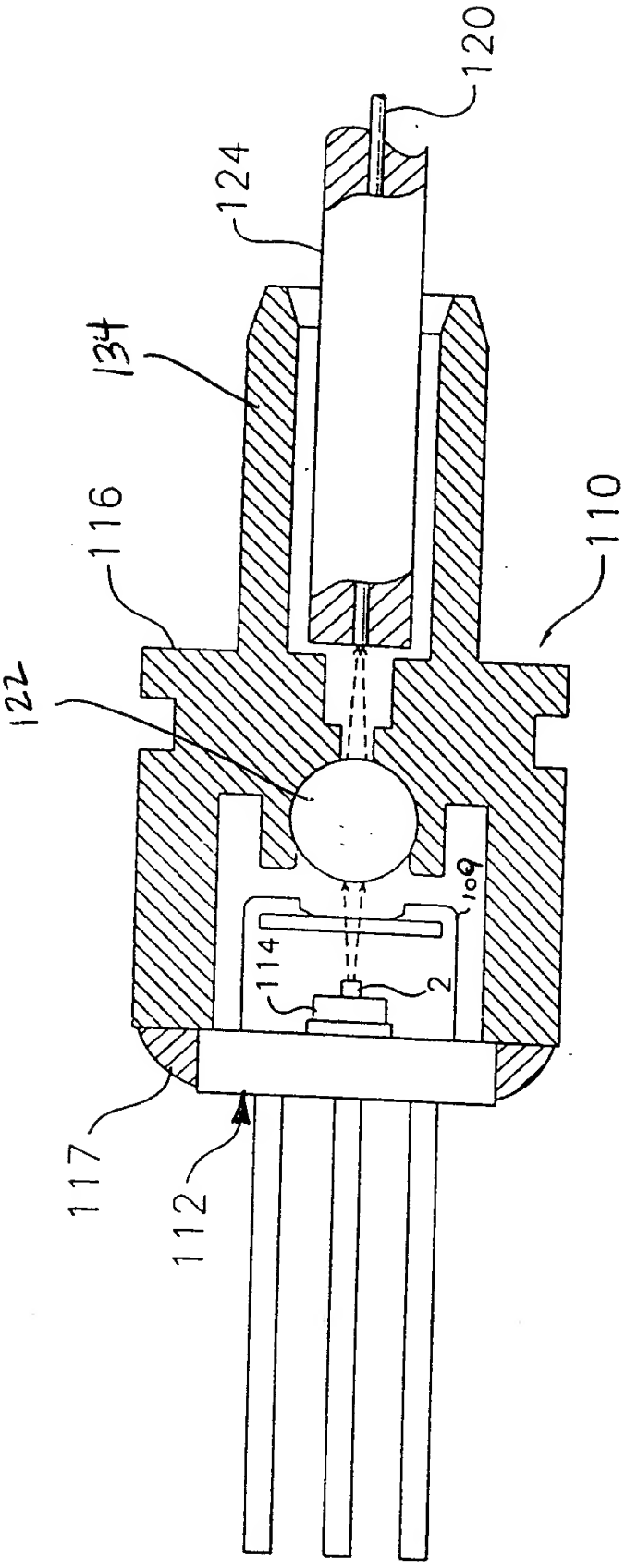


FIG. 10

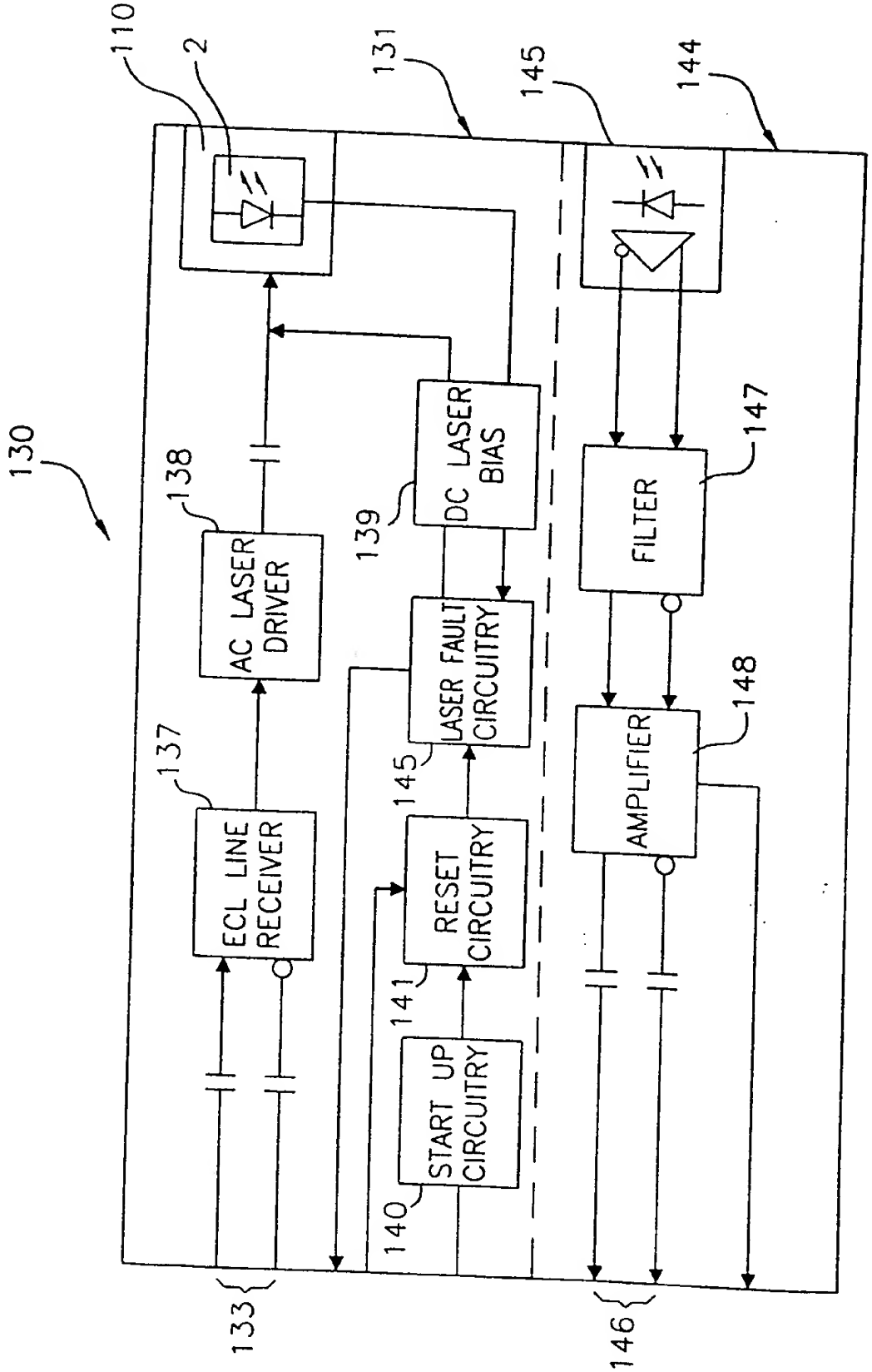


FIG. 11

VCSEL PACKAGE
PLASTIC ENCAPSULATION
W/ANGLED WINDOW

Plastic encapsulation replacement for TO56 package without impacting other packaging configs

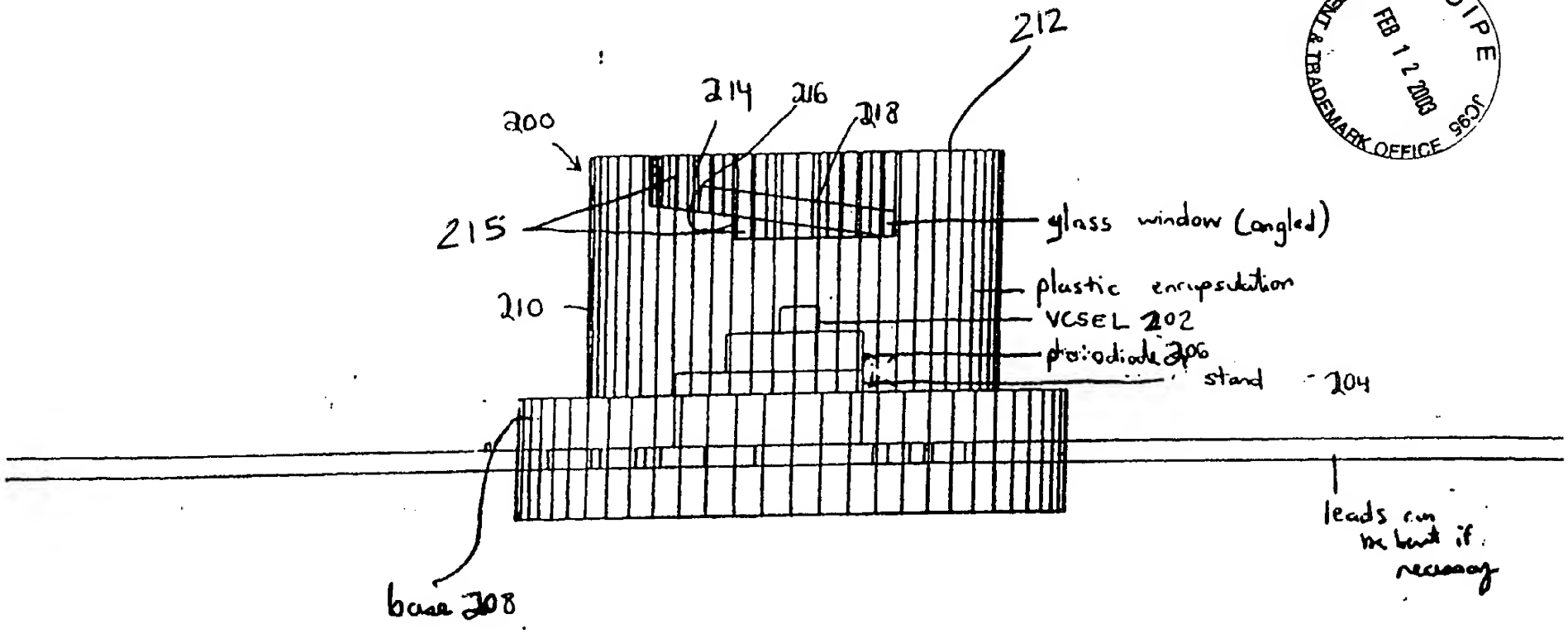
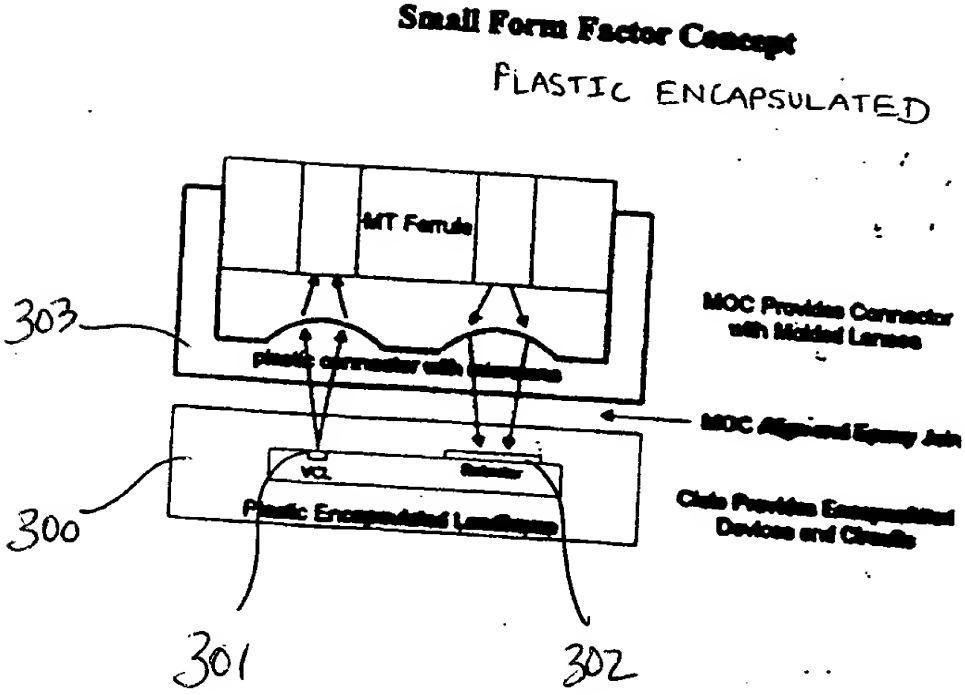


FIG. 12

FIG. 13



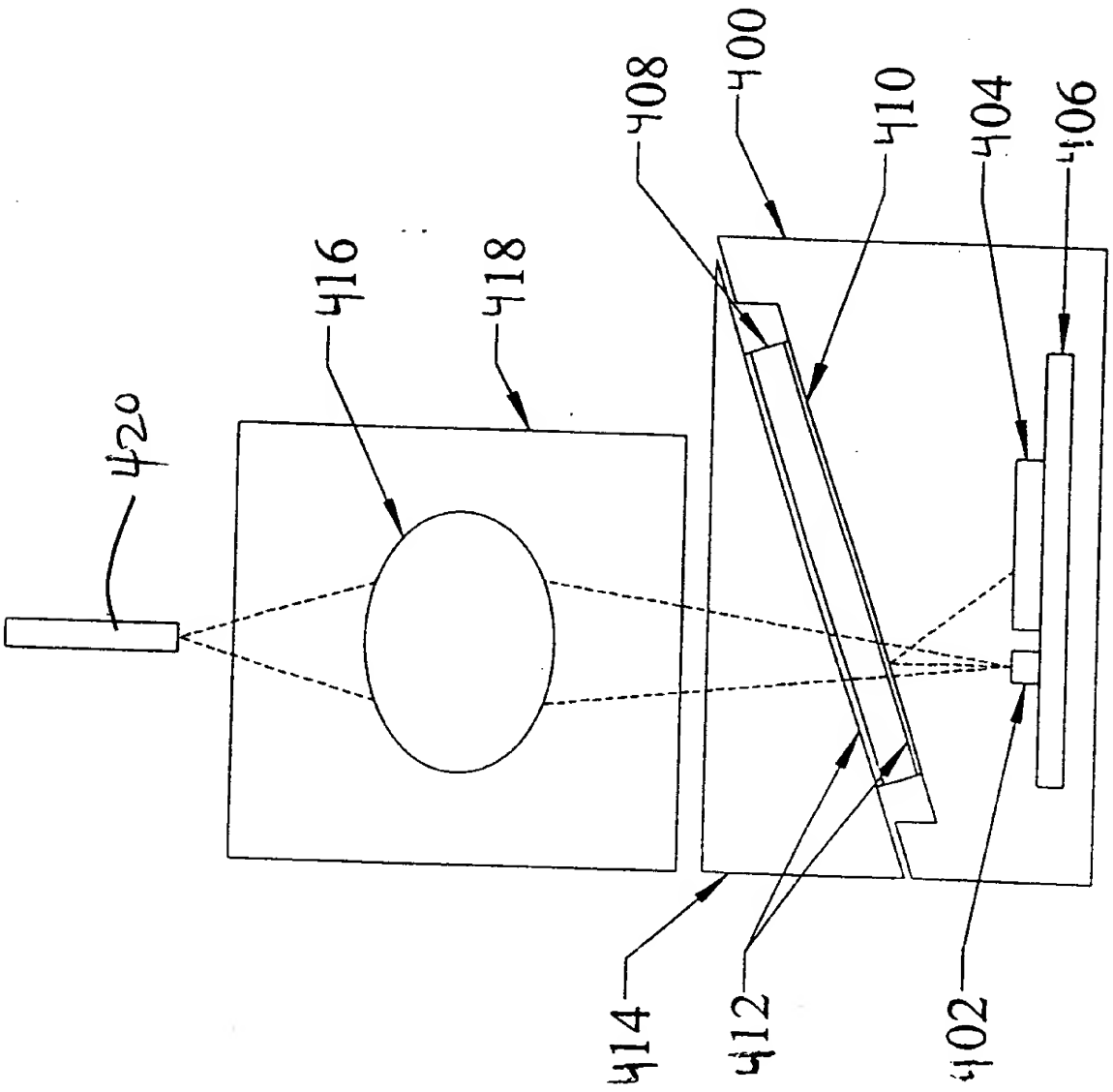


FIG. 14

FIG. 15

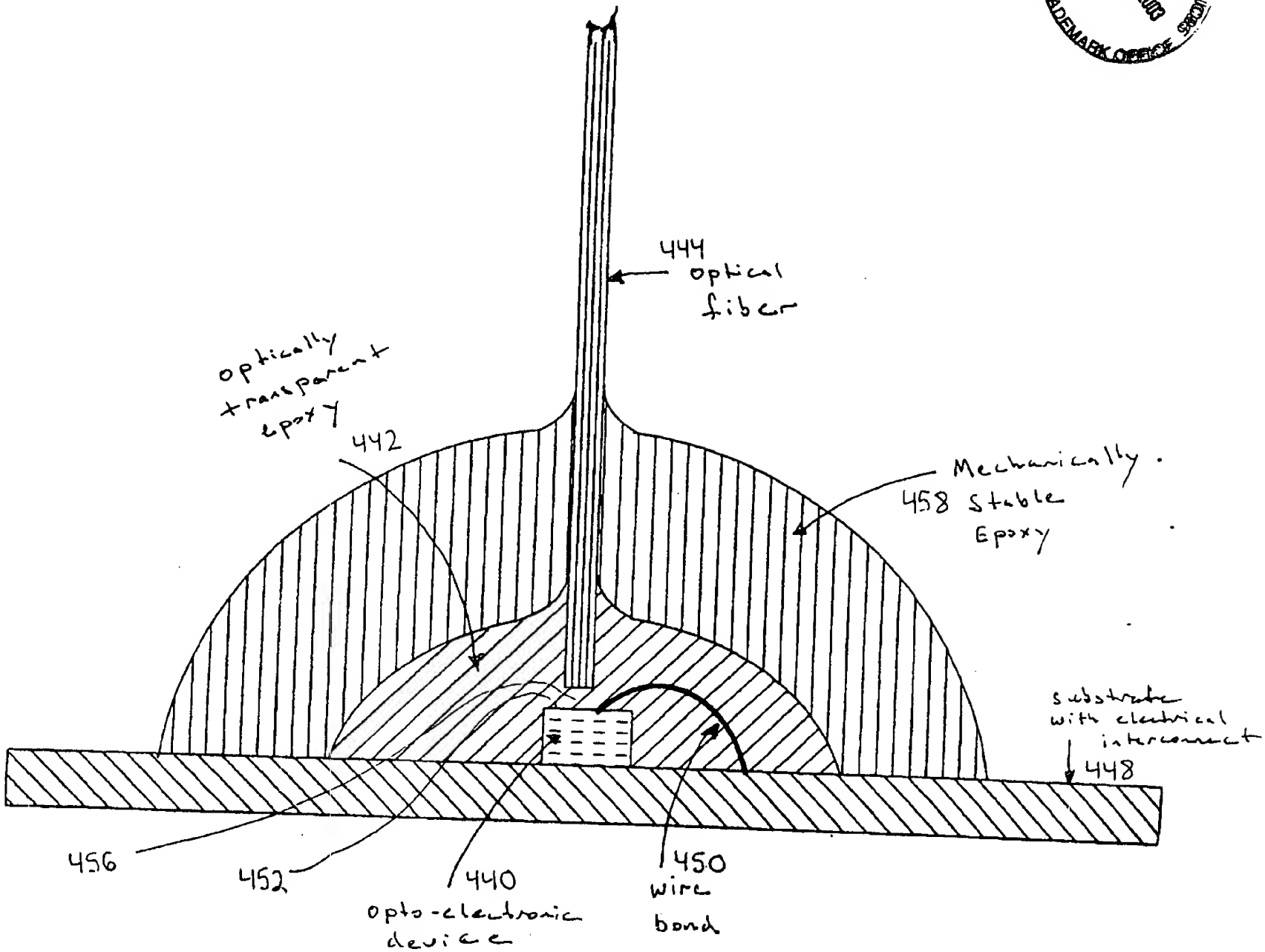
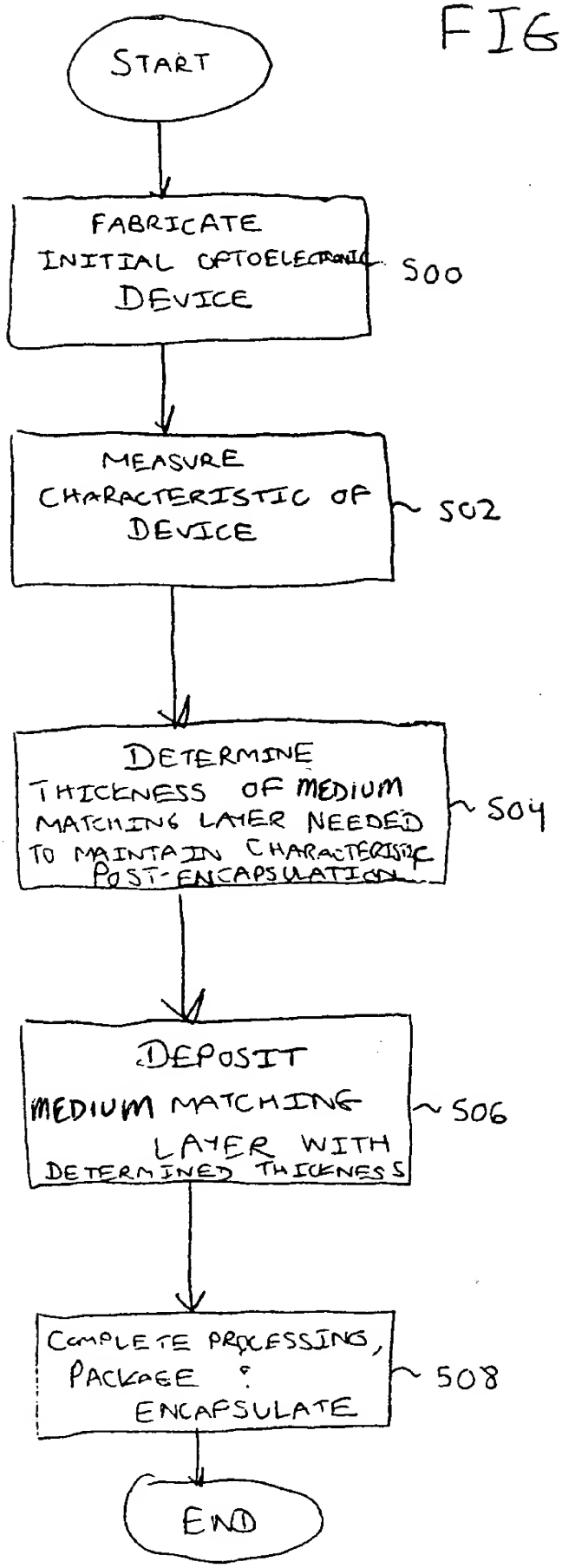


FIG. 16



VCSEL structure	Oxide Medium Match Thickness (A)	Transmission in air (%)	Transmission in plastic (%)
4 periods +	0	0.017	0.025
4 periods +	200	0.017	0.025
4 periods +	400	0.018	0.025
4 periods +	600	0.020	0.024
4 periods +	800	0.023	0.024
4 periods +	840	0.024	0.024
4 periods +	1000	0.027	0.024
4 periods +	1200	0.032	0.023
4 periods +	1400	0.034	0.023

FIG. 17

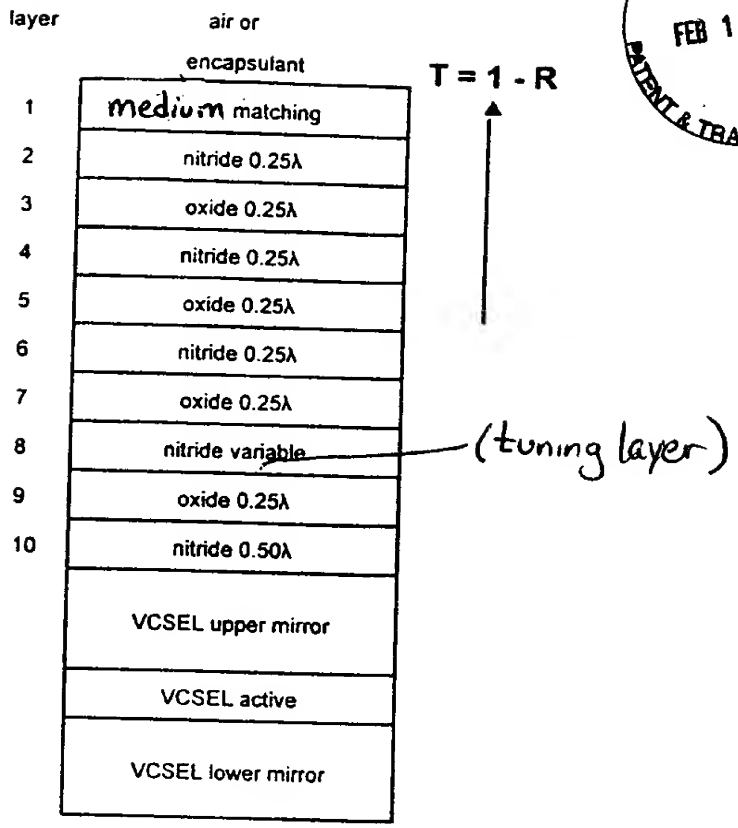
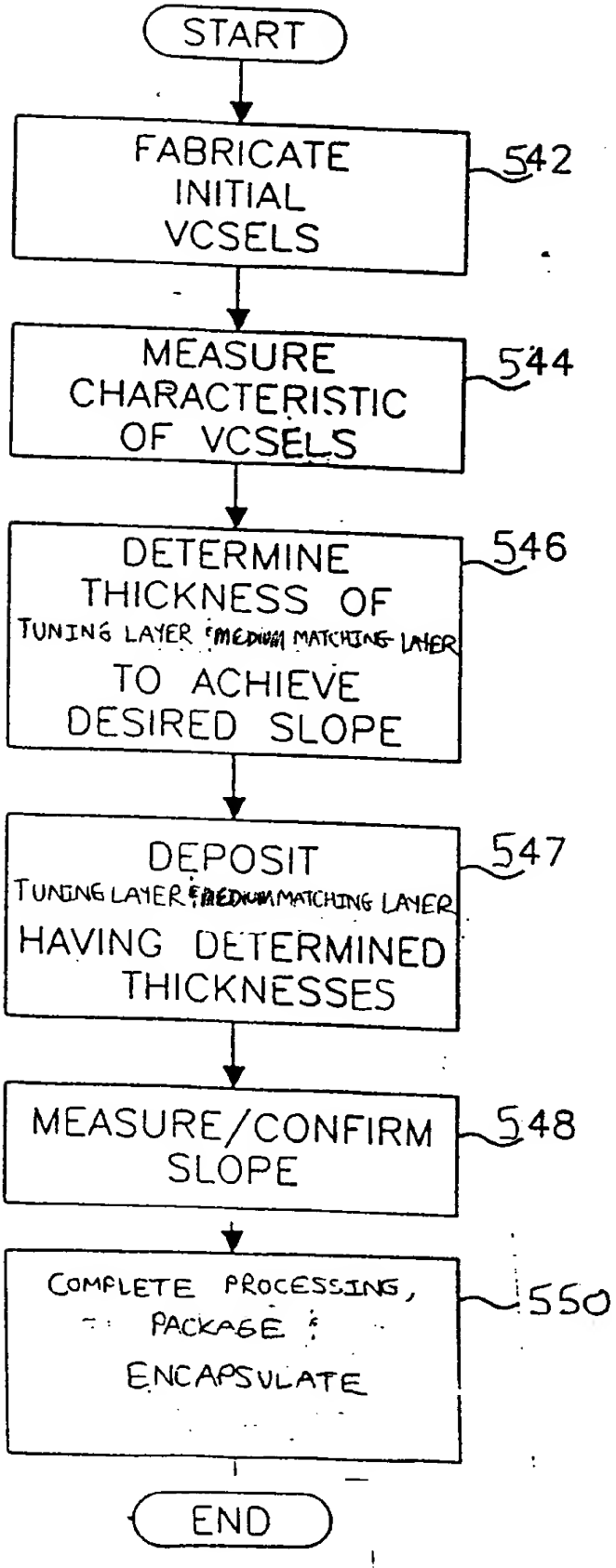


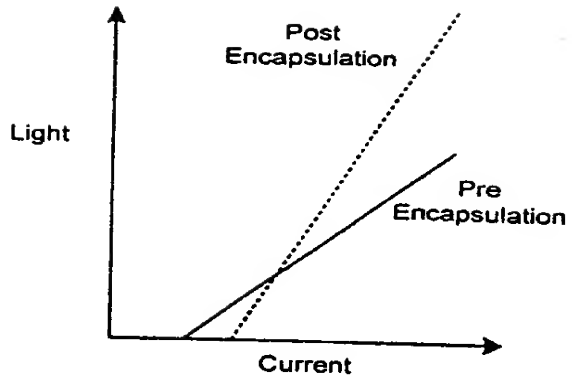
FIG. 18

Tuning Layer Thickness (layer 8)	Medium Match Thickness (layer 1)	Transmission in air or plastic	Loss	Optical Efficiency	Scaled
as grown	No mirror	0.256	0.3	0.460	1
1062	840	0.024	0.3	0.074	0.161
850	1050	0.025	0.3	0.077	0.167
637	1300	0.029	0.3	0.088	0.191
425	1550	0.036	0.3	0.107	0.233
212	1930	0.042	0.3	0.123	0.267
0	2330	0.045	0.3	0.130	0.283

FIG. 19

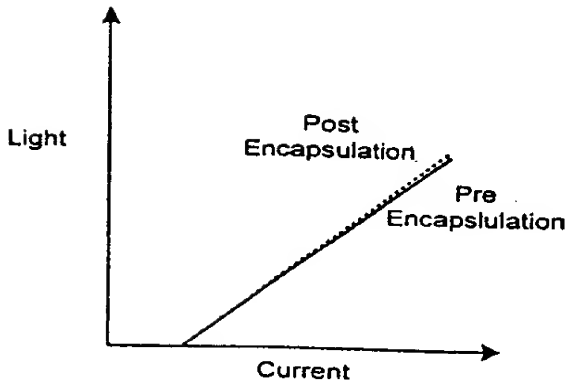
FIG. 20





Standard VCSEL Laser
without invention

FIG. 21



VCSEL Laser according to the
invention

FIG. 21A

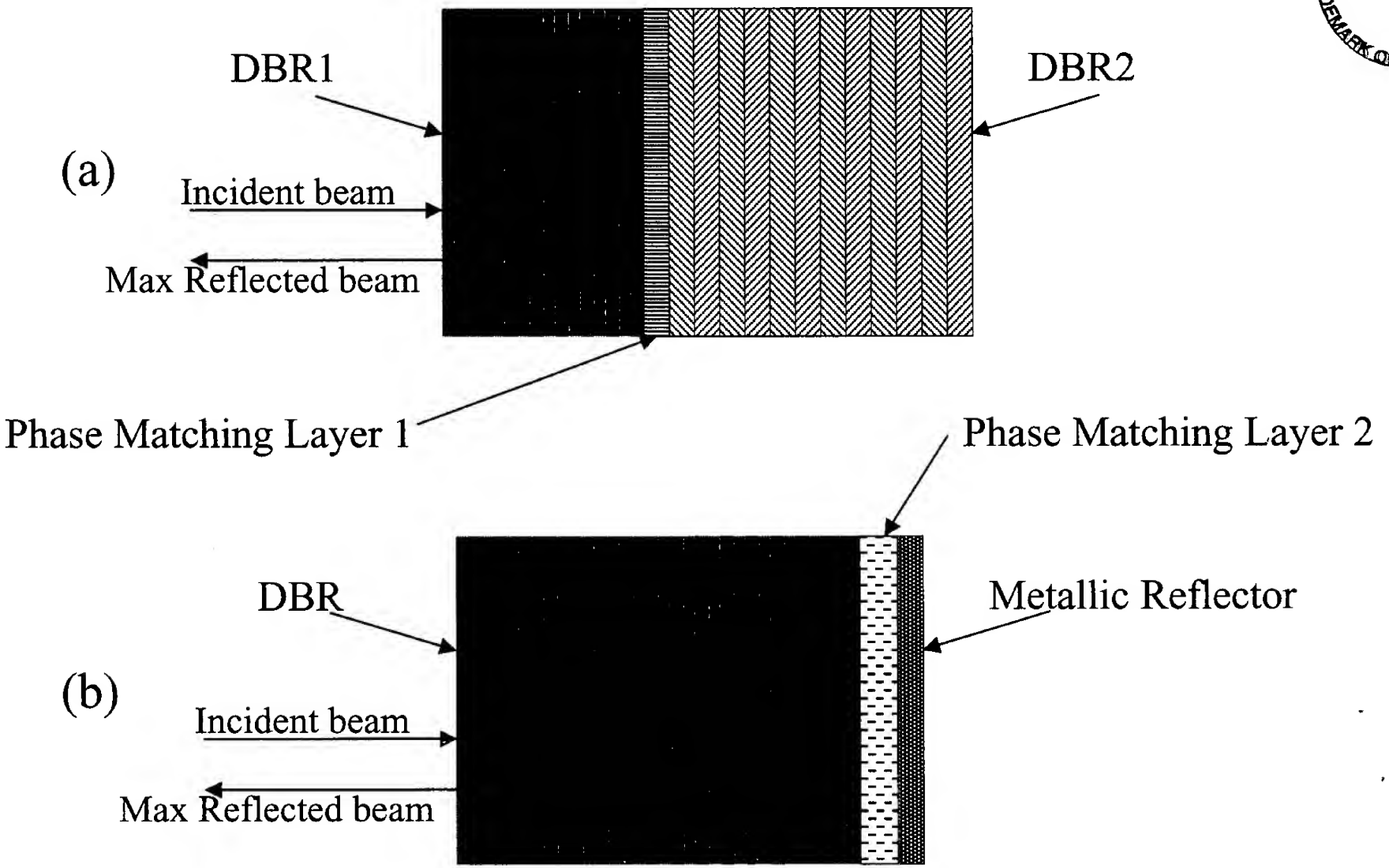


Figure 1. Prior Art Phase-Matching Layers

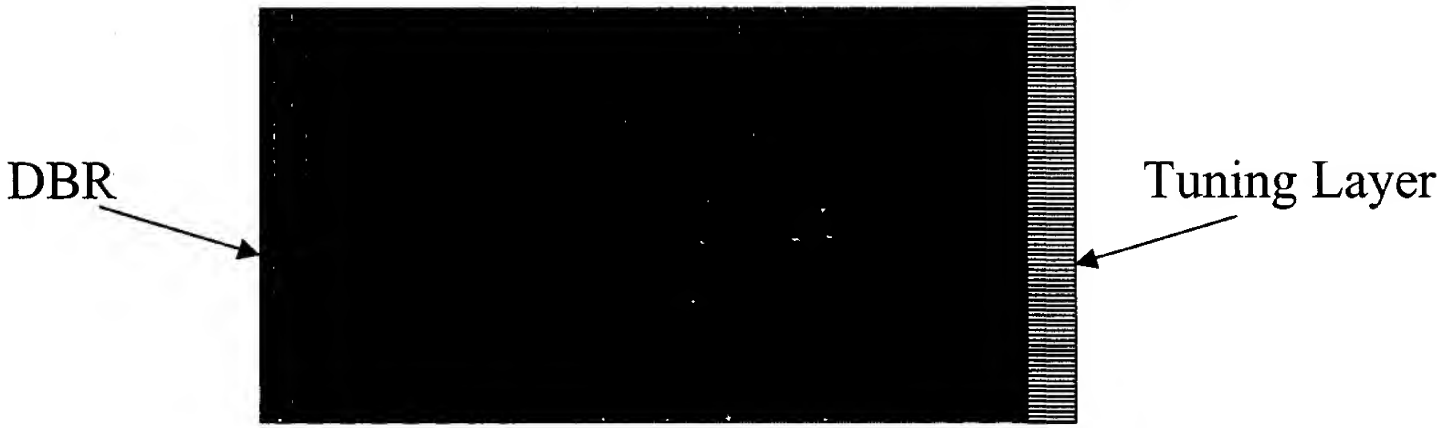


Figure 2. Prior Art Tuning Layer

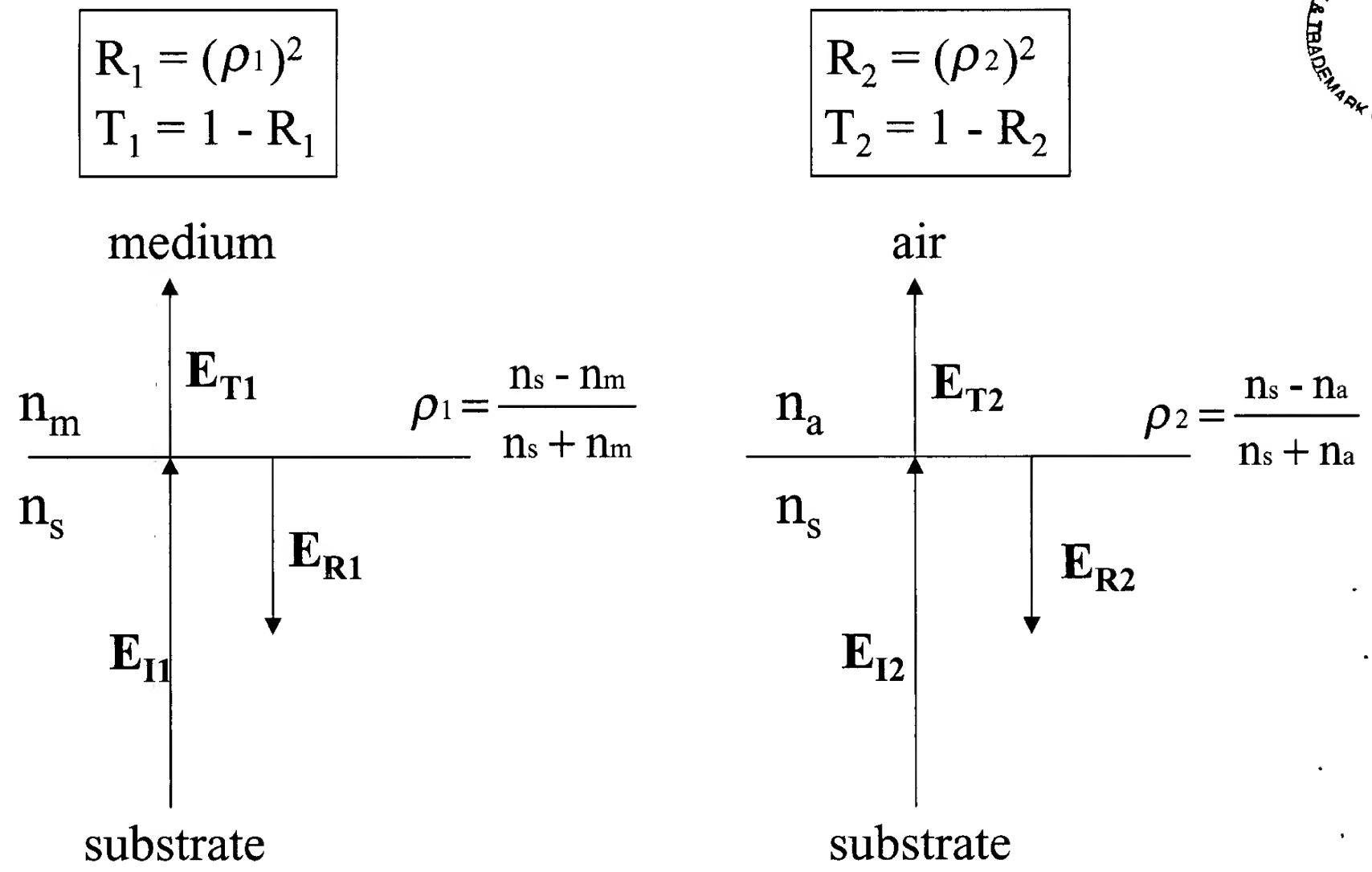


Figure 3. Elementary Example of the Problem

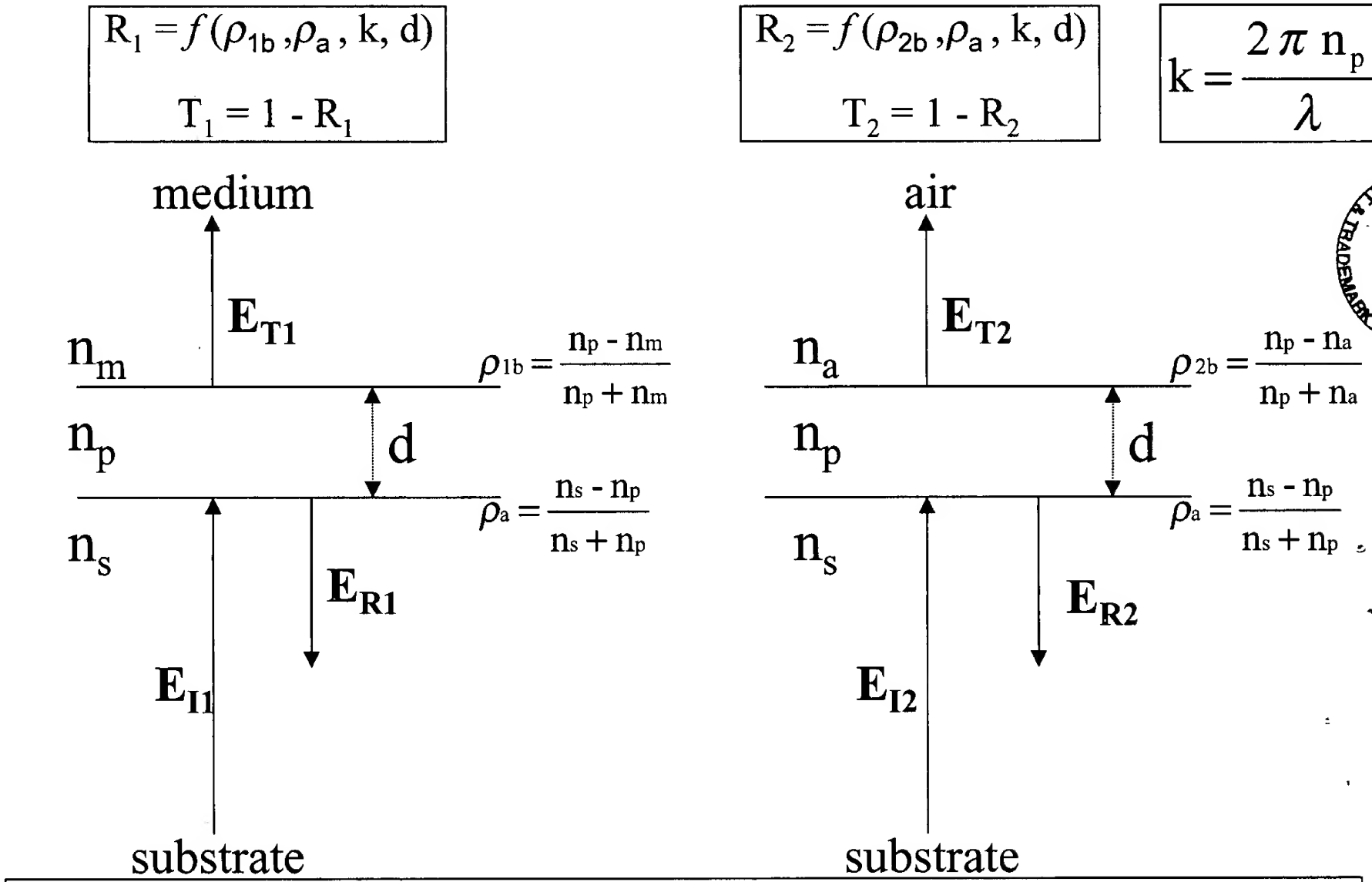


Figure 4. Elementary Example of the Solution

$$R_1 = \frac{(\rho_a + \rho_{1b})^2 - 4\rho_a\rho_{1b}\sin^2 kd}{(1 + \rho_a\rho_{1b})^2 - 4\rho_a\rho_{1b}\sin^2 kd}$$

$$R_2 = \frac{(\rho_a + \rho_{2b})^2 - 4\rho_a\rho_{2b}\sin^2 kd}{(1 + \rho_a\rho_{2b})^2 - 4\rho_a\rho_{2b}\sin^2 kd}$$

Figure 5. Formulas for the R1 & R2 in figure 4